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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/717,080

11/19/2003

Robert A. Lieberman

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7001

7590

02/04/2005

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EXAMINER

LAVARIAS, ARNEL C

ART UNIT

PAPER NUMBER

2872

DATE MAILED: 02/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/717,080

Applicant(s)

LIEBERMAN ET AL.

Examiner

Arnel C. Lavarias

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 November 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 17-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 21-27 is/are allowed.
- 6) ☒ Claim(s) 1-6, 17 and 18 is/are rejected.
- 7) ☒ Claim(s) 7-8, 19-20 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. The drawings were received on 11/10/04. These drawings are acceptable.

Response to Amendment

2. The amendments to the specification of the disclosure in the submission dated 11/10/04 are acknowledged and accepted. In view of these amendments, the objections to the specification in Section 5 of the Office Action dated 8/5/04 are respectfully withdrawn.
3. The declaration under 37 CFR 1.132 filed 11/10/04 is sufficient to overcome the rejection of Claims 6-8, 18-20, 22-25 based upon 35 U.S.C. 112, 1st paragraph. In view of the submitted declaration, the rejections of Claims 6-8, 18-20, 22-25 in Section 7 of the Office Action dated 8/5/04 are respectfully withdrawn.

Response to Arguments

4. The Applicants' arguments, see in particular Pages 4-5 of Applicants' remarks, filed 11/10/04, as well as the submitted declaration by Robert A. Lieberman, also dated 11/10/04, with respect to the rejection of Claim 21 have been fully considered and are persuasive. The rejections of Claims 21-22, 26-27 in Section 10 of the Office Action dated 8/5/04 have been withdrawn.

5. The Applicants' arguments, see in particular Pages 4-5 of Applicants' remarks, filed 11/10/04, as well as the submitted declaration by Robert A. Lieberman, also dated 11/10/04, with respect to the rejections of Claims 1 and 17 have been fully considered and are not found persuasive. The Examiner, based on the specification of the disclosure, the Applicants' remarks filed 11/10/04, and the submitted declaration by one of the inventors, also dated 11/10/04, best understands the disclosed invention to be drawn to minimizing or eliminating the nonlinear power loss associated with having multiple modes in a *multimode optical fiber*, where each of the modes generally has a different loss coefficient, by adjusting various optical fiber parameters (See Page 5 of Applicants' disclosure which list some of these parameters) in an effort to linearize (in the dB scale) the power loss over the length of the multimode optical fiber. However, Claims 1 and 17 do not specify whether the optical fibers are single-mode or multi-mode fibers. Further, DiGiovanni et al., Tarbox, and Yunoki are all drawn to the general use of single-mode fibers to provide a constant attenuation characteristic independent of position on the fiber. It is noted that for single-mode optical fibers, since there is a single mode propagating the optical fiber at the operating wavelength, the power loss over the length of the optical fiber will already be constant, thus providing a linear (in the dB scale) power loss over the length of the fiber (using Applicants' defined variables, and where \ln =natural log):

$$P = P_o e^{-\alpha l}$$
$$\frac{d \ln(P)}{dl} = -\alpha.$$

Further, it is noted that Claim 17 does not require the power loss to be constant over the length of the fiber, but only requires that a parameter "...vary from an input end to an

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output end in a way calculated to *make the power loss vary in a controlled way* over the length of the fiber.” (Emphasis added). Clearly, the use of attenuating dopants in the core or cladding, such as taught by DiGiovanni et al., Tarbox, or Yunoki, provides a way of varying the fiber attenuation in a controlled fashion.

6. Claims 1-6, 17-18 are rejected as follows.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 6, 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over DiGiovanni et al. (U.S. Patent No. 5572618), of record, in view of Tarbox (U.S. Patent No. 4881793), of record, or Yunoki (U.S. Patent No. 6097874), of record.

DiGiovanni et al. discloses an optical fiber, said fiber (See Figures 2A or 2B) having a core and a sheath (See 22, 24, 26 in Figures 2A and 2B), said fiber having at least one parameter (See Figure 2B; col. 5, lines 28-35, the parameter being a variation in the cladding and/or core diameter due to the presence of the tapered region) that varies from an input end of said fiber to an output end thereof in a manner to provide a power loss per unit length over the length of said fiber (See col. 4, line 18-col. 5, line 35). DiGiovanni et al. additionally discloses the one parameter comprising an increase in the diameter of the core from the input to the output end (See Figure 2B; col. 5, lines 28-35; in particular see

the tapered region of the fiber in Figure 2B which shows both a change, increasing and decreasing, in the core and cladding diameter of the fiber). DiGiovanni et al. lacks the power loss per unit length being constant over the length of the fiber. However, both Tarbox and Yunoki both teach optical fiber attenuators (See Figures 1 or 2 of Tarbox; Figure 2 of Yunoki) wherein the power loss per unit length is made constant over the length of fiber by careful bending of the fiber (to reduce/adjust bending losses in the attenuator) and by adjustment of the concentration of dopants incorporated into the fiber (to adjust the overall attenuation of the fiber) (See 18 in Figures 1 or 2; col. 2, line 66-col. 3, line 9 of Tarbox; col. 2, lines 12-42; col. 3, lines 1-46 of Yunoki). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the power loss per unit length being constant over the length of the fiber, as taught by either Tarbox or Yunoki, in the optical fiber of DiGiovanni et al. One would have been motivated to do this to provide easy and accurate control over the attenuation characteristics, while reducing cost of fabrication of the attenuator.

9. Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over DiGiovanni et al. in view of Tarbox or Yunoki as applied to Claim 1 above, and further in view of Hamburger et al. (U.S. Patent No. 5995686), of record.

DiGiovanni et al. in view of Tarbox or Yunoki discloses the invention as set forth above in Claim 1, except for the sheath including a cladding fabricated in a manner to be sensitive to a physical quantity or target chemical. However, Hamburger et al. teaches a distributed fiber optic sensor comprising a multimode optical fiber (See 12, 14 in Figures 1 and 2; col. 2, lines 40-65; col. 5, lines 9-15) having a core (See 12 in Figure 1) and a

permeable cladding (See 14 in Figure 1 or 2; col. 2, line 66-col. 3, line 10), said cladding including a composition responsive to an external material to generate a light signal characteristic of that response (See col. 3, line 43-63; col. 5, line 16-col. 6, line 9).

Hamburger et al. additionally discloses a light sensor at an output end (See 24 in Figure 2) and a light source in an input end (See 22 in Figure 2). Therefore, it would have been obvious to one having ordinary skill at the time the invention was made to have the sheath include a cladding fabricated in a manner to be sensitive to a physical quantity or target chemical as taught by Hamburger et al., in the optical fiber of DiGiovanni et al. in view of Tarbox or Yunoki. One would have been motivated to do this to provide additional, fine adjustment of the attenuation characteristic throughout the length of the optical fiber.

10. Claims 2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over DiGiovanni et al. in view of Tarbox or Yunoki as applied to Claim 1 above, and further in view of Cramp et al. (U.S. Patent No. 4560248), of record.

DiGiovanni et al. in view of Tarbox or Yunoki discloses the invention as set forth above in Claim 1, except for the core being fabricated in a manner to be sensitive to a target chemical or a physical quantity. However, Cramp et al. teaches that the core (See 2 of Figure 1; 14 in Figure 2; 22 in Figure 3) of an optical fiber may be modified, such as by making the core porous (See col. 3, line 67-col. 4, line 11) or treating the core with a material sensitive to a target chemical (See col. 4, lines 12-26), to make the fiber more sensitive to the physical parameters of the environment surrounding the fiber. Therefore, it would have been obvious to one having ordinary skill in the art at the time the

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invention was made to modify the core of the fiber, as taught by Cramp et al., in the optical fiber as disclosed by DiGiovanni et al. in view of Tarbox or Yunoki. One would have been motivated to do this to increase the sensitivity of the fiber to variations in parameters of the surrounding environment (e.g. refractive index, temperature, chemical species) since the fiber cladding layer is no longer present.

Allowable Subject Matter

11. Claims 21-27 are allowed.
12. Claims 7-8, 19-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
13. The following is a statement of reasons for the indication of allowable subject matter:

Claim 7 is allowable over the cited art of record for at least the reason that the cited art of record fails to teach or reasonably suggest an optical fiber having at least one parameter that varies from an input end to an output thereof in a manner to maintain constant power loss per unit length over the length of the fiber, as generally set forth in Claim 1, and further wherein the one parameter comprises the core/cladding refractive index ratio.

Claim 8 is allowable over the cited art of record for at least the reason that the cited art of record fails to teach or reasonably suggest an optical fiber having at least one parameter that varies from an input end to an output thereof in a manner to maintain constant power loss per unit length over the length of the fiber, as generally set forth in

Claim 1, and further wherein the one parameter comprises an increase in the absorption coefficient of the fiber from the input end to the output end.

Claim 19 is allowable over the cited art of record for at least the reason that the cited art of record fails to teach or reasonably suggest an optical fiber having at least one parameter that varies from an input end to an output end in a calculated to make the power loss vary in a controlled way over the length of the fiber, as generally set forth in Claim 1, and further wherein the one parameter comprises the core/cladding refractive index ratio.

Claim 20 is allowable over the cited art of record for at least the reason that the cited art of record fails to teach or reasonably suggest an optical fiber having at least one parameter that varies from an input end to an output end in a way calculated to make the power loss vary in a controlled way over the length of the fiber, as generally set forth in Claim 1, and further wherein the one parameter comprises an increase in the scattering coefficient of the fiber from the input end to the output end.

Claim 21 is allowable over the cited art of record for at least the reason that the cited art of record fails to teach or reasonably suggest a distributed fiber optic sensor comprising a multi-mode fiber, as generally set forth in Claim 21, the fiber including at least one parameter that varies as a function of position within the fiber to compensate for any non-linear power loss over the length of the fiber. Claims 22-27 are dependent on Claim 21, and hence are allowable for at least the same reasons Claim 21 is allowable.

Conclusion

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnel C. Lavarias whose telephone number is 571-272-2315. The examiner can normally be reached on M-F 9:30 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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2/2/05



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